

# Fisher® 685 Piston Actuator

The 685 is a double-acting piston actuator that provides accurate, high thrust output for short to long travel applications. This actuator is designed for use with a variety of medium to large Fisher sliding-stem control valves including the easy-e™, FB, TBX, HP, EH, and 461.

The 685 family is available in several configurations to cover a wide range of application requirements. Typical travels range from 25 to 610 mm (1 to 24 inches) and cylinder diameters range from 305 to 660 mm (12 to 26 inches). Thrust capabilities extend to 354 kN (79,000 lbf) and above with special constructions.

The 685 can be used with the FIELDVUE™ DVC6200 digital valve controller for throttling applications, or with switching valves for on-off control. This actuator can also be fitted with volume boosters for fast stroking requirements.

## Features

- **High Thrust Capability** – Maximum thrusts of up to 354 kN (79,000 lbf) can be produced.
- **Broad Application Coverage** – Standard constructions offer travels of up to 610 mm (24 inches) and cylinder diameters of up to 660 mm (26 inches). Even larger constructions are available upon request.
- **Low Friction** – Low friction piston seals and either chrome plated or fluoropolymer coated cylinder bores reduce sliding friction and wear.
- **Wide Temperature Range** – Standard constructions offer a temperature range of -40 to 93°C (-40 to 200°F), however higher or lower temperatures are possible. Special constructions can operate as low as -54°C (-65°F) and as high as 204°C (400°F).
- **Manual Override** – An optional side-mounted handwheel is capable of extending or retracting the actuator manually and can be engaged at any position from full open to full closed.



X0922



Table 1. Specifications

**Operating Pressure<sup>(1)</sup>****Minimum:** 2.7 bar (40psig)**Maximum Allowable:** 10.3 bar (150 psig)

Consult your Emerson Process Management sales office for supply pressures under 2.7 bar (40 psig)

**Travel<sup>(2)</sup>**

25 mm (1 inch) through 610 mm (24 inch)

See table 4

**Thrust Capabilities**

See table 5

**Piston Diameter and Area<sup>(2)</sup>**

Available in 51 mm (2 inch) increments between 305 mm (12 inch) and 660 mm (26 inch)

See table 4

For additional sizes, contact your Emerson Process Management sales office.

**Operative Temperature Limits****Standard:** -40 to 93°C (-40 to 200°F)**Low Temperature:** -54 to 93°C (-65 to 200°F)<sup>(3)</sup>**High Temperature:** -29 to 204°C (-20 to 400°F)<sup>(3)</sup>**Yoke Boss and Valve Stem Diameter**

■ 127 mm (5H inch) yoke boss with 32 mm (1-1/4 inch) stem ■ 178 mm (7 inch) yoke boss with 51 mm (2 inch) stem

**Pressure Connections****Standard:** 3/4 NPT**Optional:** 1 and 1-1/4 NPT

See figure 2 and table 6

**Instrument Mounting**

Mounting kits are available for use with the FIELDVUE DVC6200 series positioner

**Construction Materials**

| PART              | MATERIAL  |
|-------------------|---|
| Yoke              | ASTM A36 (steel)  |
| Piston            | ASTM A36 (steel)  |
| Cylinder          | <b>305 to 559 mm (12 to 22 inch) cylinder:</b> 1026 DOM (steel) with chrome-plated bore<br><b>610 to 660 mm (24 to 26 inch) cylinder:</b> ASTM A516 Grade 70 (steel) with fluoropolymer coated bore |
| Upper/Lower Heads | ASTM A36 (steel)  |
| Tie Bolt          | ASTM A311 1045, Class B (steel)   |
| Piston Rod        | S31603 (316L stainless steel)   |
| Stem Connector    | ASTM A36 (steel)  |

**Weights**

See tables 11 and 12

**Lifting Point Load Ratings**

See table 2

**Options**


■ Mechanical Handwheel, ■ Pneumatic fail mode via Fisher 377 trip valve, ■ Volume Boosters, ■ Fisher Optimized Digital Valve (ODV) Package

**Dimensions**

See figure 3 and tables 7, 8, 9, and 10

**Certifications**

■ Pressure Equipment Directive (PED) 97/23/EC, ■ ATEX Group II Category 2 Gas and Dust

CE  II 2 G D

■ Systematic Safety Integrity, SIL 3, ■ GOST-R (Russia), ■ GOST-K (Kazakhstan)

1. The pressure/temperature limits in this bulletin and any other applicable standard or code should not be exceeded.

2. Consult factory for larger travels or cylinder diameters. The Fisher 585C family of actuators can be used for smaller travels or cylinder diameters.

3. Consult factory for applications requiring low or high temperature requirements.

## Principle of Operation

685 piston actuators utilize a pneumatically controlled piston that moves inside of a cylinder to generate thrust. A seal contained on the circumference of the piston provides a seal between the piston and the cylinder, preventing supply pressure leakage.

From an equilibrium state, the actuator operates by reacting to a force unbalance that is created by increasing supply pressure on one side of the piston, and decreasing it on the other. This moves the piston up or down, and results in a repositioning of the attached control valve. Travel can be adjusted using travel limits within a valve positioner, which limit the travel range of the actuator. The optional handwheel manual override does not have the ability to act as a hard travel stop.

An optional handwheel manual override is capable of extending or retracting the actuator manually and can be engaged at any position from full open to full close. This override utilizes a worm gear assembly that is attached to the stem connector and not attached to the cylinder or piston rod. This enables the manual override to reposition the control valve even if the

actuator cylinder or piston is removed for maintenance.

## Instrument Selection

An excellent selection of sensitive and accurate instruments is available for 685 piston actuators. These include the FIELDVUE DVC6200 digital valve controller, as well trip valves and volume boosters.

### DVC6200 Digital Valve Controller

FIELDVUE DVC6200 digital valve controllers are communicating, microprocessor-based current-to-pneumatic instruments. In addition to the traditional function of converting a current signal to a pressure signal, DVC6200 digital valve controllers, using HART® or FOUNDATION™ fieldbus communications protocol, give easy access to information critical to process operation.

For additional information, refer to Fisher bulletin 62.1:DVC6200 (D103415X012) or 62.1:DVC6200f (D103399X012), available at [www.FIELDVUE.com](http://www.FIELDVUE.com) or from your Emerson Process Management sales office.

Figure 1. Fisher 685 Piston Actuator

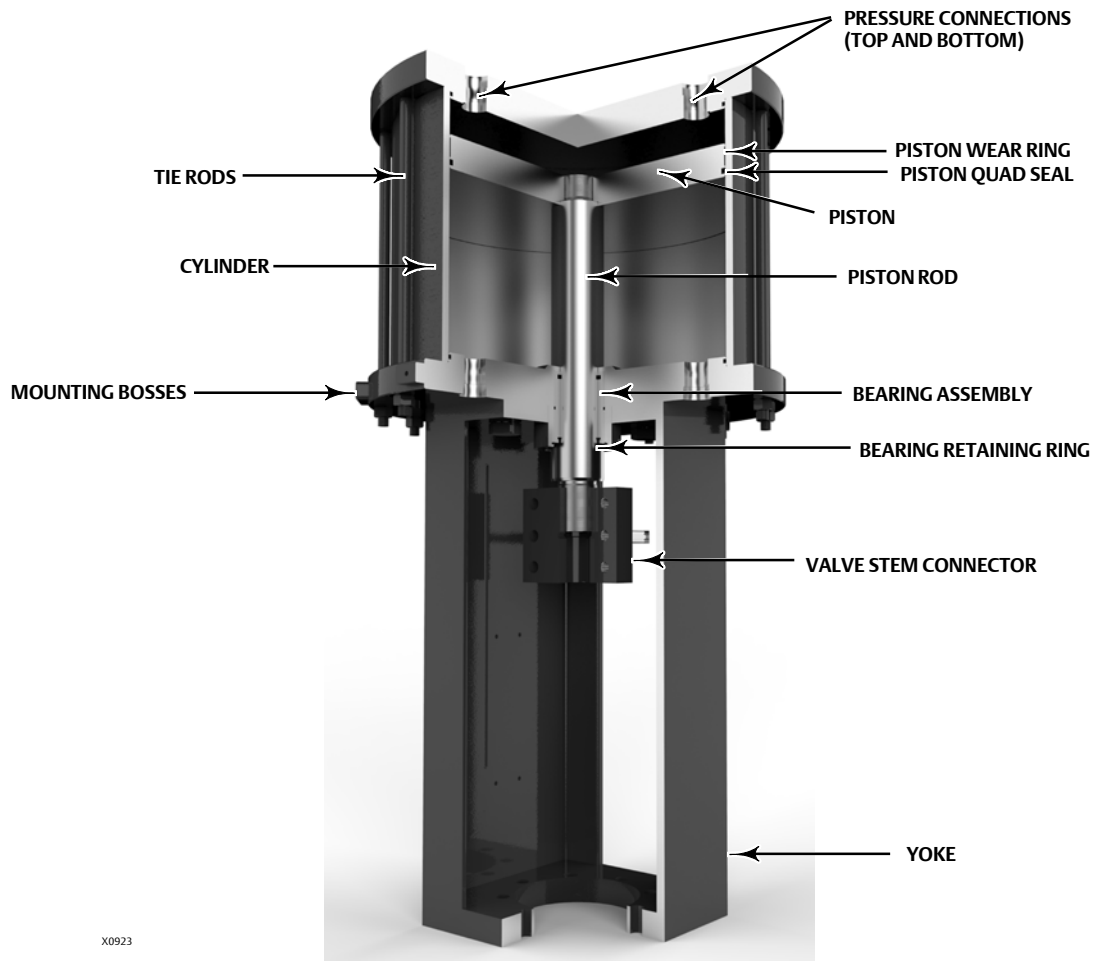


Table 2. Lifting Point Load Ratings

| ACTUATOR SIZE | LIFTING ORIENTATION            | NUMBER OF LIFTING POINTS USED | MAXIMUM LOAD |       |
|---------------|--------------------------------|-------------------------------|--------------|-------|
|               |                                |                               | kg           | lbs   |
| 12 to 24      | Actuator Centerline Horizontal | 2                             | 1540         | 3400  |
| 26            |                                | 2                             | 2860         | 6300  |
| 12 to 24      | Actuator Centerline Vertical   | 2                             | 3760         | 8300  |
| 26            |                                | 2                             | 6350         | 14000 |

Table 3. Handwheel Specification

| ACTUATOR SIZE | OUTPUT THRUST |       | HANDWHEEL DIAMETER |      | TURNS PER mm OF TRAVEL | TURNS PER INCH OF TRAVEL | MAXIMUM RIM FORCE REQUIRED |     |
|---------------|---------------|-------|--------------------|------|------------------------|--------------------------|----------------------------|-----|
|               | N             | lbs   | mm                 | Inch |                        |                          | N                          | lbs |
| 12            | 44482         | 10000 | 305                | 12   | 3.8                    | 96                       | 290                        | 65  |
| 14 to 18      | 88964         | 20000 | 406                | 16   | 3.0                    | 80                       | 380                        | 85  |
| 20 to 26      | 133447        | 30000 | 610                | 24   | 2.8                    | 72                       | 450                        | 100 |

**Table 4. Standard Constructions<sup>(1)</sup>**

| ACTUATOR SIZE   | PISTON DIAMETER | PISTON ROD AREA | PISTON AREA | VALVE STEM CONNECTOR SIZE | YOKE BOSS DIAMETER | VALVE TRAVEL |         |
|---|-----------------|-----------------|-------------|---------------------------|--------------------|--------------|---------|
|   |                 |                 |             |                           |                    | Minimum      | Maximum |
| mm (cm <sup>2</sup> for Area)   |                 |                 |             |                           |                    |              |         |
| 12  | 305             | 16              | 730         | 32 or 51                  | 127 or 178         | >203         | 610     |
| 14  | 356             | 32              | 993         | 32 or 51                  | 127 or 178         | >203         | 610     |
| 16  | 406             | 32              | 1297        | 32 or 51                  | 127 or 178         | >203         | 610     |
| 18  | 457             | 32              | 1642        | 32 or 51                  | 127 or 178         | >203         | 610     |
| 20  | 508             | 46              | 2027        | 32 or 51                  | 127 or 178         | 25           | 610     |
| 22  | 559             | 46              | 2452        | 32 or 51                  | 127 or 178         | 25           | 610     |
| 24  | 610             | 62              | 2919        | 32 or 51                  | 127 or 178         | 25           | 610     |
| 26  | 660             | 62              | 3425        | 32 or 51                  | 127 or 178         | 25           | 610     |
| Inches (inch <sup>2</sup> for Area)   |                 |                 |             |                           |                    |              |         |
| 12  | 12              | 2.41            | 113         | 1 1/4 or 2                | 5H or 7            | >8           | 24      |
| 14  | 14              | 4.91            | 154         | 1 1/4 or 2                | 5H or 7            | >8           | 24      |
| 16  | 16              | 4.91            | 201         | 1 1/4 or 2                | 5H or 7            | >8           | 24      |
| 18  | 18              | 4.91            | 254         | 1 1/4 or 2                | 5H or 7            | >8           | 24      |
| 20  | 20              | 7.07            | 314         | 1 1/4 or 2                | 5H or 7            | 1            | 24      |
| 22  | 22              | 7.07            | 380         | 1 1/4 or 2                | 5H or 7            | 1            | 24      |
| 24  | 24              | 9.62            | 452         | 1 1/4 or 2                | 5H or 7            | 1            | 24      |
| 26  | 26              | 9.62            | 531         | 1 1/4 or 2                | 5H or 7            | 1            | 24      |
| 1. Consult your Emerson Process Management sales office for additional sizes. |                 |                 |             |                           |                    |              |         |

1. Consult your Emerson Process Management sales office for additional sizes.

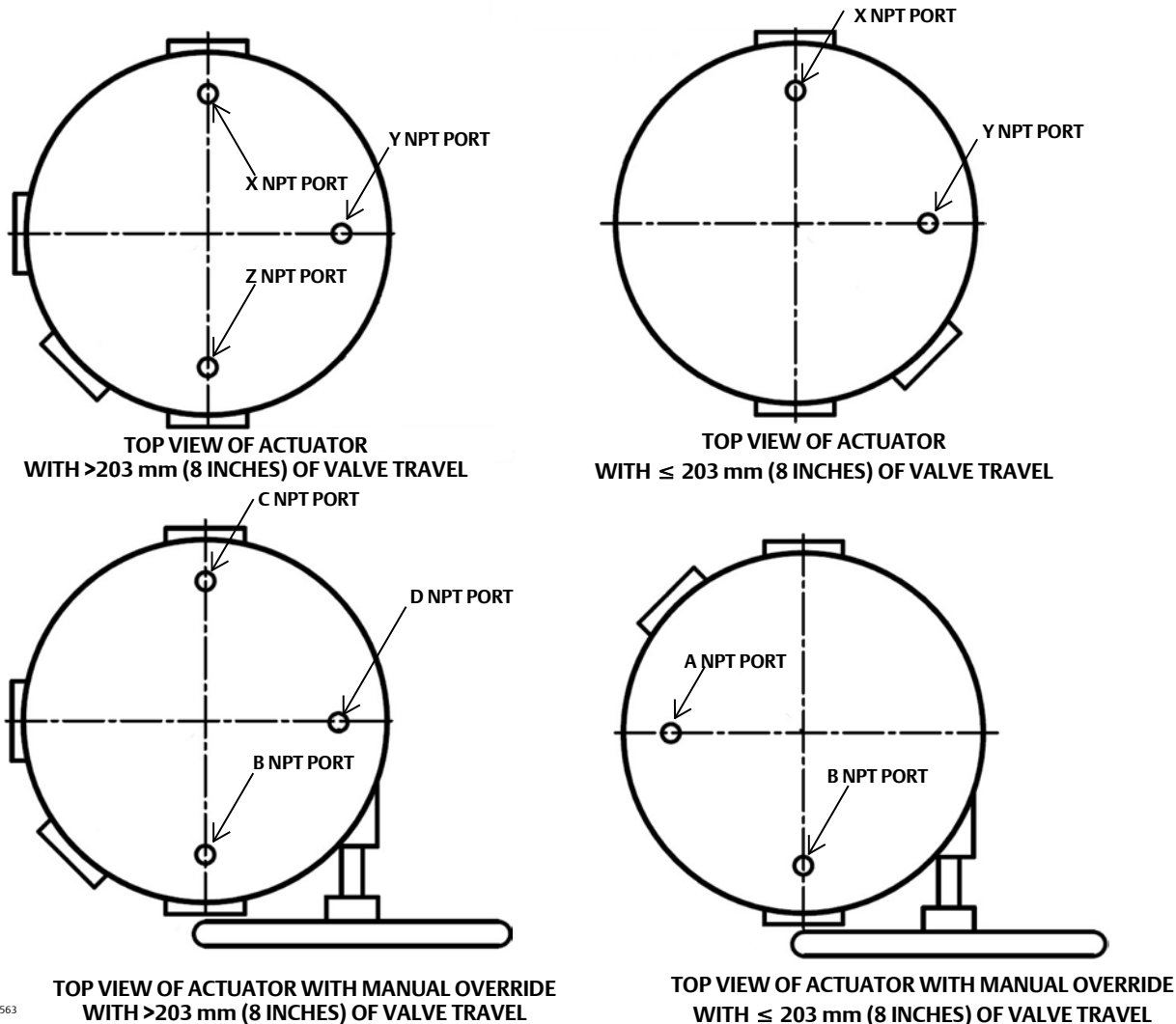
**Table 5. Thrust**

| ACTUATOR SIZE | STROKE | THRUST AT SUPPLY PRESSURE, N (LBF) <sup>(1)</sup> |                    |                     |                                     |
|---------------|--------|---|--------------------|---------------------|-------------------------------------|
|               |        | 4.1 barg (60 psig)                                | 5.5 barg (80 psig) | 6.9 barg (100 psig) | 10.3 barg (150 psig) <sup>(2)</sup> |
| 12            | Push   | 30183 (6786)                                      | 40245 (9048)       | 50306 (11310)       | 75459 (16965)                       |
| 14            |        | 41083 (9236)                                      | 54777 (12315)      | 68472 (15394)       | 102707 (23091)                      |
| 16            |        | 53659 (12064)                                     | 71546 (16085)      | 89432 (20106)       | 134149 (30159)                      |
| 18            |        | 67913 (15268)                                     | 90550 (20358)      | 113188 (25447)      | 169782 (38170)                      |
| 20            |        | 83843 (18850)                                     | 111790 (25133)     | 139738 (31416)      | 209607 (47124)                      |
| 22            |        | 101450 (22808)                                    | 135266 (30411)     | 169083 (38013)      | 253625 (57020)                      |
| 24            |        | 120734 (27143)                                    | 160978 (36191)     | 201223 (45239)      | 301834 (67858)                      |
| 26            |        | 141694 (31856)                                    | 188926 (42474)     | 236157 (53093)      | 354236 (79639)                      |
| 12            | Pull   | 29540 (6641)                                      | 39387 (8855)       | 49234 (11069)       | 73851 (16603)                       |
| 14            |        | 39773 (8942)                                      | 53030 (11922)      | 66288 (14903)       | 99432 (22354)                       |
| 16            |        | 52349 (11769)                                     | 69799 (15692)      | 87248 (19615)       | 130873 (29423)                      |
| 18            |        | 66602 (14974)                                     | 88803 (19965)      | 111004 (24956)      | 166506 (37434)                      |
| 20            |        | 81956 (18425)                                     | 109275 (24567)     | 136593 (30709)      | 204890 (46063)                      |
| 22            |        | 99563 (22384)                                     | 132751 (29845)     | 165938 (37306)      | 248907 (55959)                      |
| 24            |        | 118166 (26566)                                    | 157555 (35422)     | 196944 (44277)      | 295416 (66415)                      |
| 26            |        | 139127 (31279)                                    | 185503 (41705)     | 231878 (52131)      | 347817 (78196)                      |

1. Consult your Emerson Process Management sales office for supply pressures below 40 psig.

2. Maximum available thrust.

Figure 2. Position of Pressure Connections



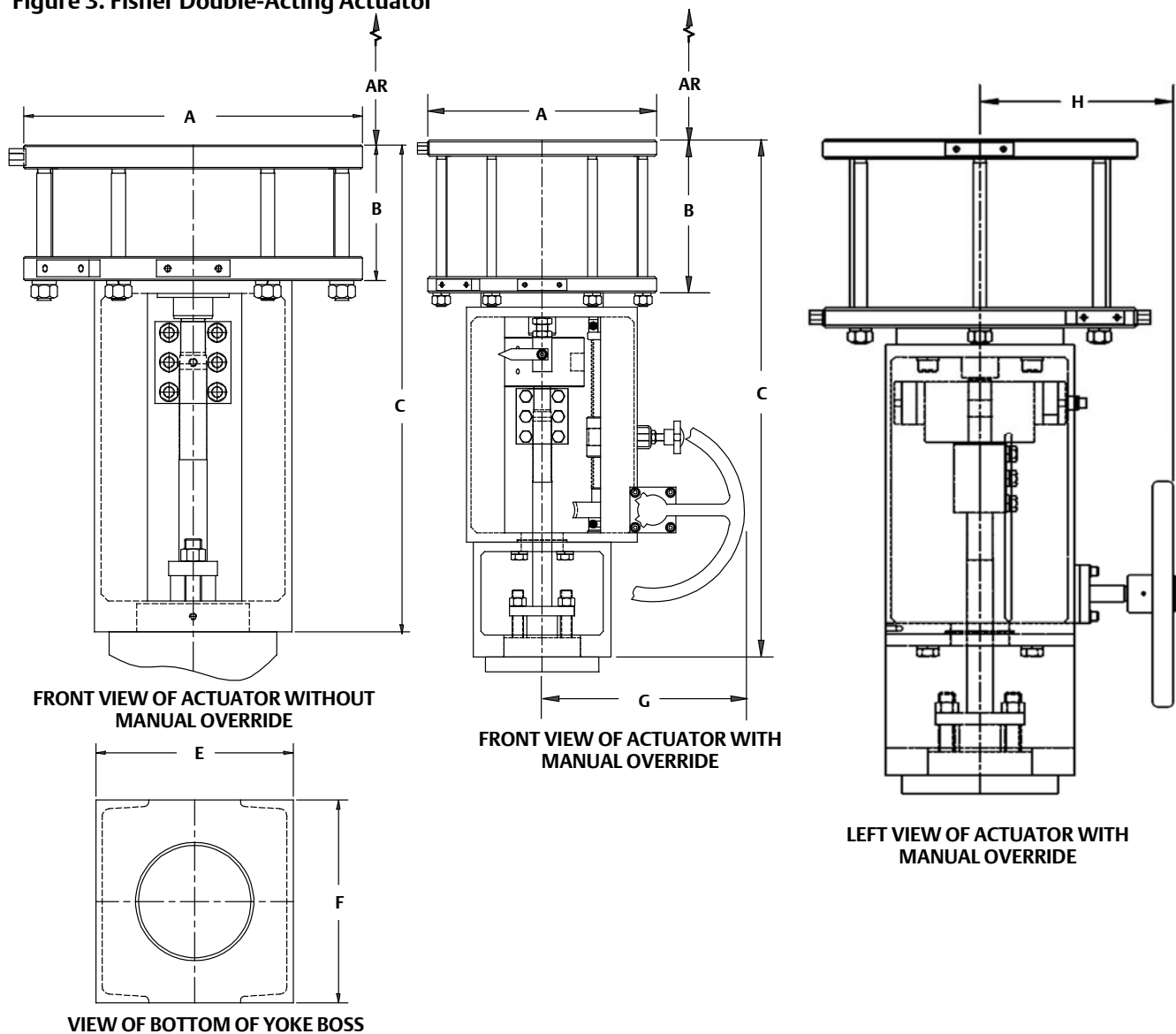
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Table 6. Supply Connections

| WITH MANUAL OVERRIDE | ACTUATOR SIZE | TRAVEL |        | SUPPLY CONNECTION        |                                      |                         |
|----------------------|---------------|--------|--------|--------------------------|--------------------------------------|-------------------------|
|                      |               | mm     | Inches | Size, NPT <sup>(2)</sup> | Quantity (Top/Bottom) <sup>(2)</sup> | Location <sup>(1)</sup> |
| No                   | 12            | >203   | >8     | 3/4                      | 1/1                                  | Z                       |
|                      |               |        |        |                          | 2/2                                  | X and Z                 |
|                      | 14 to 26      | >203   | >8     | 3/4, 1, or 1-1/4         | 1/1                                  | Z                       |
|                      |               |        |        |                          | 2/2                                  | Y and Z                 |
|                      | 20 to 26      | ≤ 203  | ≤ 8    | 3/4, 1, or 1-1/4         | 1/1                                  | Y                       |
|                      |               |        |        |                          | 2/2                                  | X and Y                 |
| Yes                  | 12            | >203   | >8     | 3/4                      | 1/1                                  | B                       |
|                      |               |        |        |                          | 2/2                                  | B and C                 |
|                      | 14 to 26      | >203   | >8     | 3/4, 1, or 1-1/4         | 1/1                                  | B                       |
|                      |               |        |        |                          | 2/2                                  | B and D                 |
|                      | 20 to 26      | ≤ 203  | ≤ 8    | 3/4, 1, or 1-1/4         | 1/1                                  | A                       |
|                      |               |        |        |                          | 2/2                                  | A and B                 |

1. Refer to figure 2.  
2. Quantity of 2 top and 2 bottom is available as standard for 3/4 NPT only.

**Figure 3. Fisher Double-Acting Actuator**



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Table 7. Dimensions A, G, and H

| ACTUATOR SIZE | A   |       | G   |       | H   |       |
|---------------|-----|-------|-----|-------|-----|-------|
|               | mm  | Inch  | mm  | Inch  | mm  | Inch  |
| 12            | 381 | 15.00 | 338 | 13.31 | 235 | 9.25  |
| 14            | 432 | 17.00 | 435 | 17.13 | 253 | 9.98  |
| 16            | 489 | 19.25 | 435 | 17.13 | 253 | 9.98  |
| 18            | 543 | 21.38 | 435 | 17.13 | 253 | 9.98  |
| 20            | 591 | 23.25 | 581 | 22.88 | 434 | 17.10 |
| 22            | 654 | 25.75 | 581 | 22.88 | 434 | 17.10 |
| 24            | 711 | 28.00 | 584 | 23.00 | 484 | 19.06 |
| 26            | 775 | 30.50 | 584 | 23.00 | 484 | 19.06 |

Table 8. Dimension B

| ACTUATOR SIZE | Dimension B for Maximum Valve Travel, mm (Inch) |       |                 |       |                     |       |                     |       |                     |       |                     |       |
|---------------|---|-------|-----------------|-------|---------------------|-------|---------------------|-------|---------------------|-------|---------------------|-------|
|               | 102 mm (4 inch)                                 |       | 203 mm (8 inch) |       | 305 mm (12.00 inch) |       | 406 mm (16.00 inch) |       | 508 mm (20.00 inch) |       | 610 mm (24.00 inch) |       |
|               | mm  | Inch  | mm              | Inch  | mm                  | Inch  | mm                  | Inch  | mm                  | Inch  | mm                  | Inch  |
| 12            |   |       |                 |       | 432                 | 17.00 | 533                 | 21.00 | 635                 | 25.00 | 737                 | 29.00 |
| 14            |   |       |                 |       | 445                 | 17.50 | 546                 | 21.50 | 648                 | 25.50 | 749                 | 29.50 |
| 16            |   |       |                 |       | 445                 | 17.50 | 546                 | 21.50 | 648                 | 25.50 | 749                 | 29.50 |
| 18            |   |       |                 |       | 445                 | 17.50 | 546                 | 21.50 | 648                 | 25.50 | 749                 | 29.50 |
| 20            | 259   | 10.20 | 361             | 14.20 | 462                 | 18.20 | 564                 | 22.20 | 665                 | 26.20 | 767                 | 30.20 |
| 22            | 259   | 10.20 | 361             | 14.20 | 462                 | 18.20 | 564                 | 22.20 | 665                 | 26.20 | 767                 | 30.20 |
| 24            | 265   | 10.45 | 367             | 14.45 | 469                 | 18.45 | 570                 | 22.45 | 672                 | 26.45 | 773                 | 30.45 |
| 26            | 265   | 10.45 | 367             | 14.45 | 469                 | 18.45 | 570                 | 22.45 | 672                 | 26.45 | 773                 | 30.45 |

Table 9. Dimensions E and F

| ACTUATOR SIZE | WITHOUT MANUAL OVERRIDE |       |                  |       |              |       |                  |       | WITH MANUAL OVERRIDE |       |                  |       |              |       |                  |       |
|---------------|-------------------------|-------|------------------|-------|--------------|-------|------------------|-------|----------------------|-------|------------------|-------|--------------|-------|------------------|-------|
|               | E                       |       |                  |       | F            |       |                  |       | E                    |       |                  |       | F            |       |                  |       |
|               | 5H Yoke Boss            |       | 7 Inch Yoke Boss |       | 5H Yoke Boss |       | 7 Inch Yoke Boss |       | 5H Yoke Boss         |       | 7 Inch Yoke Boss |       | 5H Yoke Boss |       | 7 Inch Yoke Boss |       |
|               | mm                      | Inch  | mm               | Inch  | mm           | Inch  | mm               | Inch  | mm                   | Inch  | mm               | Inch  | mm           | Inch  | mm               | Inch  |
| 12            | 222                     | 8.75  | 267              | 10.50 | 203          | 8.00  | 229              | 9.00  | 251                  | 9.88  | 279              | 11.00 | 229          | 9.00  | 229              | 9.00  |
| 14            | 229                     | 9.00  | 267              | 10.50 | 203          | 8.00  | 229              | 9.00  | 238                  | 9.38  | 279              | 11.00 | 305          | 12.00 | 305              | 12.00 |
| 16            | 229                     | 9.00  | 267              | 10.50 | 203          | 8.00  | 229              | 9.00  | 238                  | 9.38  | 279              | 11.00 | 305          | 12.00 | 305              | 12.00 |
| 18            | 229                     | 9.00  | 267              | 10.50 | 203          | 8.00  | 229              | 9.00  | 238                  | 9.38  | 279              | 11.00 | 305          | 12.00 | 305              | 12.00 |
| 20            | 305                     | 12.00 | 305              | 12.00 | 305          | 12.00 | 305              | 12.00 | 305                  | 12.00 | 305              | 12.00 | 330          | 13.00 | 330              | 13.00 |
| 22            | 305                     | 12.00 | 305              | 12.00 | 305          | 12.00 | 305              | 12.00 | 305                  | 12.00 | 305              | 12.00 | 330          | 13.00 | 330              | 13.00 |
| 24            | 406                     | 16.00 | 406              | 16.00 | 457          | 18.00 | 457              | 18.00 | 476                  | 18.75 | 476              | 18.75 | 457          | 18.00 | 457              | 18.00 |
| 26            | 406                     | 16.00 | 406              | 16.00 | 457          | 18.00 | 457              | 18.00 | 476                  | 18.75 | 476              | 18.75 | 457          | 18.00 | 457              | 18.00 |



**Table 10. Dimensions C and AR (Actuator Removal Clearance)**

| ACTUATOR SIZE  | MAXIMUM VALVE TRAVEL |       | WITHOUT MANUAL OVERRIDE |       |                  |       |                                 |       |                  |       | WITH MANUAL OVERRIDE |       |                  |       |                                 |       |                  |       |
|----------------|----------------------|-------|-------------------------|-------|------------------|-------|---------------------------------|-------|------------------|-------|----------------------|-------|------------------|-------|---------------------------------|-------|------------------|-------|
|                |                      |       | C                       |       |                  |       | AR (Actuator Removal Clearance) |       |                  |       | C                    |       |                  |       | AR (Actuator Removal Clearance) |       |                  |       |
|                |                      |       | 5H Yoke Boss            |       | 7 Inch Yoke Boss |       | 5H Yoke Boss                    |       | 7 Inch Yoke Boss |       | 5H Yoke Boss         |       | 7 Inch Yoke Boss |       | 5H Yoke Boss                    |       | 7 Inch Yoke Boss |       |
|                | mm                   | Inch  | mm                      | Inch  | mm               | Inch  | mm                              | Inch  | mm               | Inch  | mm                   | Inch  | mm               | Inch  | mm                              | Inch  | mm               | Inch  |
| 12             | 267                  | 10.50 | 1078                    | 42.44 | 1078             | 42.44 | 381                             | 15.00 | 381              | 15.00 | 1192                 | 46.94 | 1192             | 46.94 | 381                             | 15.00 | 381              | 15.00 |
|                | 279                  | 11.00 | 1078                    | 42.44 | 1078             | 42.44 | 318                             | 12.50 | 318              | 12.50 | 1192                 | 46.94 | 1230             | 48.44 | 318                             | 12.50 | 356              | 14.00 |
|                | 305                  | 12.00 | 1078                    | 42.44 | 1078             | 42.44 | 305                             | 12.00 | 305              | 12.00 | 1218                 | 47.94 | 1230             | 48.44 | 330                             | 13.00 | 343              | 13.50 |
|                | 368                  | 14.50 | 1281                    | 50.44 | 1281             | 50.44 | 381                             | 15.00 | 381              | 15.00 | 1319                 | 51.94 | 1395             | 54.94 | 305                             | 12.00 | 381              | 15.00 |
|                | 381                  | 15.00 | 1281                    | 50.44 | 1281             | 50.44 | 318                             | 12.50 | 318              | 12.50 | 1319                 | 51.94 | 1434             | 56.44 | 241                             | 9.50  | 356              | 14.00 |
|                | 406                  | 16.00 | 1281                    | 50.44 | 1281             | 50.44 | 305                             | 12.00 | 305              | 12.00 | 1421                 | 55.94 | 1434             | 56.44 | 330                             | 13.00 | 343              | 13.50 |
|                | 470                  | 18.50 | 1484                    | 58.44 | 1484             | 58.44 | 381                             | 15.00 | 381              | 15.00 | 1599                 | 62.94 | 1599             | 62.94 | 381                             | 15.00 | 381              | 15.00 |
|                | 483                  | 19.00 | 1484                    | 58.44 | 1484             | 58.44 | 318                             | 12.50 | 318              | 12.50 | 1599                 | 62.94 | 1637             | 64.44 | 318                             | 12.50 | 356              | 14.00 |
|                | 508                  | 20.00 | 1484                    | 58.44 | 1484             | 58.44 | 305                             | 12.00 | 305              | 12.00 | 1624                 | 63.94 | 1637             | 64.44 | 330                             | 13.00 | 343              | 13.50 |
|                | 572                  | 22.50 | 1688                    | 66.44 | 1688             | 66.44 | 381                             | 15.00 | 381              | 15.00 | 1802                 | 70.94 | 1802             | 70.94 | 381                             | 15.00 | 381              | 15.00 |
|                | 584                  | 23.00 | 1688                    | 66.44 | 1688             | 66.44 | 318                             | 12.50 | 318              | 12.50 | 1802                 | 70.94 | 1840             | 72.44 | 318                             | 12.50 | 356              | 14.00 |
|                | 610                  | 24.00 | 1688                    | 66.44 | 1688             | 66.44 | 305                             | 12.00 | 305              | 12.00 | 1827                 | 71.94 | 1840             | 72.44 | 330                             | 13.00 | 343              | 13.50 |
| 14, 16, and 18 | 267                  | 10.50 | 1124                    | 44.25 | 1124             | 44.25 | 381                             | 15.00 | 381              | 15.00 | 1294                 | 50.94 | 1294             | 50.94 | 381                             | 15.00 | 381              | 15.00 |
|                | 279                  | 11.00 | 1124                    | 44.25 | 1124             | 44.25 | 318                             | 12.50 | 318              | 12.50 | 1294                 | 50.94 | 1332             | 52.44 | 318                             | 12.50 | 356              | 14.00 |
|                | 305                  | 12.00 | 1124                    | 44.25 | 1124             | 44.25 | 305                             | 12.00 | 305              | 12.00 | 1319                 | 51.94 | 1332             | 52.44 | 330                             | 13.00 | 343              | 13.50 |
|                | 368                  | 14.50 | 1327                    | 52.25 | 1327             | 52.25 | 381                             | 15.00 | 381              | 15.00 | 1421                 | 55.94 | 1497             | 58.94 | 305                             | 12.00 | 381              | 15.00 |
|                | 381                  | 15.00 | 1327                    | 52.25 | 1327             | 52.25 | 318                             | 12.50 | 318              | 12.50 | 1421                 | 55.94 | 1535             | 60.44 | 241                             | 9.50  | 356              | 14.00 |
|                | 406                  | 16.00 | 1327                    | 52.25 | 1327             | 52.25 | 305                             | 12.00 | 305              | 12.00 | 1522                 | 59.94 | 1535             | 60.44 | 330                             | 13.00 | 343              | 13.50 |
|                | 470                  | 18.50 | 1530                    | 60.25 | 1530             | 60.25 | 381                             | 15.00 | 381              | 15.00 | 1700                 | 66.94 | 1700             | 66.94 | 381                             | 15.00 | 381              | 15.00 |
|                | 483                  | 19.00 | 1530                    | 60.25 | 1530             | 60.25 | 318                             | 12.50 | 318              | 12.50 | 1700                 | 66.94 | 1738             | 68.44 | 318                             | 12.50 | 356              | 14.00 |
|                | 508                  | 20.00 | 1530                    | 60.25 | 1530             | 60.25 | 305                             | 12.00 | 305              | 12.00 | 1726                 | 67.94 | 1738             | 68.44 | 330                             | 13.00 | 343              | 13.50 |
|                | 572                  | 22.50 | 1734                    | 68.25 | 1734             | 68.25 | 381                             | 15.00 | 381              | 15.00 | 1903                 | 74.94 | 1903             | 74.94 | 381                             | 15.00 | 381              | 15.00 |
|                | 584                  | 23.00 | 1734                    | 68.25 | 1734             | 68.25 | 318                             | 12.50 | 318              | 12.50 | 1903                 | 74.94 | 1942             | 76.44 | 318                             | 12.50 | 356              | 14.00 |
|                | 610                  | 24.00 | 1734                    | 68.25 | 1734             | 68.25 | 305                             | 12.00 | 305              | 12.00 | 1929                 | 75.94 | 1942             | 76.44 | 330                             | 13.00 | 343              | 13.50 |
| 20 and 22      | 102                  | 4.00  | 754                     | 29.69 | 786              | 30.94 | 334                             | 13.13 | 365              | 14.38 | 937                  | 36.88 | 949              | 37.38 | 381                             | 15.00 | 394              | 15.50 |
|                | 152                  | 6.00  | 941                     | 37.06 | 967              | 38.06 | 343                             | 13.50 | 368              | 14.50 | 1140                 | 44.88 | 1102             | 43.38 | 406                             | 16.00 | 368              | 14.50 |
|                | 203                  | 8.00  | 941                     | 37.06 | 1018             | 40.06 | 292                             | 11.50 | 368              | 14.50 | 1140                 | 44.88 | 1153             | 45.38 | 356                             | 14.00 | 368              | 14.50 |
|                | 267                  | 10.50 | 1183                    | 46.56 | 1183             | 46.56 | 381                             | 15.00 | 381              | 15.00 | 1318                 | 51.88 | 1318             | 51.88 | 381                             | 15.00 | 381              | 15.00 |
|                | 279                  | 11.00 | 1183                    | 46.56 | 1183             | 46.56 | 318                             | 12.50 | 318              | 12.50 | 1318                 | 51.88 | 1356             | 53.38 | 318                             | 12.50 | 356              | 14.00 |
|                | 305                  | 12.00 | 1183                    | 46.56 | 1183             | 46.56 | 305                             | 12.00 | 305              | 12.00 | 1343                 | 52.88 | 1356             | 53.38 | 330                             | 13.00 | 343              | 13.50 |
|                | 368                  | 14.50 | 1386                    | 54.56 | 1386             | 54.56 | 381                             | 15.00 | 381              | 15.00 | 1445                 | 56.88 | 1521             | 59.88 | 305                             | 12.00 | 381              | 15.00 |
|                | 381                  | 15.00 | 1386                    | 54.56 | 1386             | 54.56 | 318                             | 12.50 | 318              | 12.50 | 1445                 | 56.88 | 1559             | 61.38 | 241                             | 9.50  | 356              | 14.00 |
|                | 406                  | 16.00 | 1386                    | 54.56 | 1386             | 54.56 | 305                             | 12.00 | 305              | 12.00 | 1546                 | 60.88 | 1559             | 61.38 | 330                             | 13.00 | 343              | 13.50 |
|                | 470                  | 18.50 | 1589                    | 62.56 | 1589             | 62.56 | 381                             | 15.00 | 381              | 15.00 | 1724                 | 67.88 | 1724             | 67.88 | 381                             | 15.00 | 381              | 15.00 |
|                | 483                  | 19.00 | 1589                    | 62.56 | 1589             | 62.56 | 318                             | 12.50 | 318              | 12.50 | 1724                 | 67.88 | 1762             | 69.38 | 318                             | 12.50 | 356              | 14.00 |
|                | 508                  | 20.00 | 1589                    | 62.56 | 1589             | 62.56 | 305                             | 12.00 | 305              | 12.00 | 1750                 | 68.88 | 1762             | 69.38 | 330                             | 13.00 | 343              | 13.50 |
|                | 572                  | 22.50 | 1792                    | 70.56 | 1792             | 70.56 | 381                             | 15.00 | 381              | 15.00 | 1927                 | 75.88 | 1927             | 75.88 | 381                             | 15.00 | 381              | 15.00 |
|                | 584                  | 23.00 | 1792                    | 70.56 | 1792             | 70.56 | 318                             | 12.50 | 318              | 12.50 | 1927                 | 75.88 | 1965             | 77.38 | 318                             | 12.50 | 356              | 14.00 |
|                | 610                  | 24.00 | 1792                    | 70.56 | 1792             | 70.56 | 305                             | 12.00 | 305              | 12.00 | 1953                 | 76.88 | 1965             | 77.38 | 330                             | 13.00 | 343              | 13.50 |

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Table 10. Dimensions C and AR (Actuator Removal Clearance) (continued)

| ACTUATOR<br>SIZE | MAXIMUM<br>VALVE<br>TRAVEL |       | WITHOUT MANUAL OVERRIDE |       |                     |       |                                    |       |                     |       | WITH MANUAL OVERRIDE |       |                     |       |                                    |       |                     |       |
|------------------|----------------------------|-------|-------------------------|-------|---------------------|-------|------------------------------------|-------|---------------------|-------|----------------------|-------|---------------------|-------|------------------------------------|-------|---------------------|-------|
|                  |                            |       | C                       |       |                     |       | AR (Actuator Removal<br>Clearance) |       |                     |       | C                    |       |                     |       | AR (Actuator Removal<br>Clearance) |       |                     |       |
|                  |                            |       | 5H Yoke Boss            |       | 7 Inch Yoke<br>Boss |       | 5H Yoke Boss                       |       | 7 Inch Yoke<br>Boss |       | 5H Yoke Boss         |       | 7 Inch Yoke<br>Boss |       | 5H Yoke Boss                       |       | 7 Inch Yoke<br>Boss |       |
|                  |                            |       | mm                      | Inch  | mm                  | Inch  | mm                                 | Inch  | mm                  | Inch  | mm                   | Inch  | mm                  | Inch  | mm                                 | Inch  | mm                  | Inch  |
| 24 and 26        | 102                        | 4.00  | 794                     | 31.26 | 826                 | 32.51 | 334                                | 13.13 | 365                 | 14.38 | 1000                 | 39.38 | 1013                | 39.88 | 381                                | 15.00 | 394                 | 15.50 |
|                  | 152                        | 6.00  | 981                     | 38.63 | 1007                | 39.63 | 343                                | 13.50 | 368                 | 14.50 | 1203                 | 47.38 | 1165                | 45.88 | 406                                | 16.00 | 368                 | 14.50 |
|                  | 203                        | 8.00  | 981                     | 38.63 | 1057                | 41.63 | 292                                | 11.50 | 368                 | 14.50 | 1203                 | 47.38 | 1216                | 47.88 | 356                                | 14.00 | 368                 | 14.50 |
|                  | 267                        | 10.50 | 1223                    | 48.13 | 1223                | 48.13 | 381                                | 15.00 | 381                 | 15.00 | 1381                 | 54.38 | 1381                | 54.38 | 381                                | 15.00 | 381                 | 15.00 |
|                  | 279                        | 11.00 | 1223                    | 48.13 | 1223                | 48.13 | 318                                | 12.50 | 318                 | 12.50 | 1381                 | 54.38 | 1419                | 55.88 | 318                                | 12.50 | 356                 | 14.00 |
|                  | 305                        | 12.00 | 1223                    | 48.13 | 1223                | 48.13 | 305                                | 12.00 | 305                 | 12.00 | 1407                 | 55.38 | 1419                | 55.88 | 330                                | 13.00 | 343                 | 13.50 |
|                  | 368                        | 14.50 | 1426                    | 56.13 | 1426                | 56.13 | 381                                | 15.00 | 381                 | 15.00 | 1508                 | 59.38 | 1584                | 62.38 | 305                                | 12.00 | 381                 | 15.00 |
|                  | 381                        | 15.00 | 1426                    | 56.13 | 1426                | 56.13 | 318                                | 12.50 | 318                 | 12.50 | 1508                 | 59.38 | 1623                | 63.88 | 241                                | 9.50  | 356                 | 14.00 |
|                  | 406                        | 16.00 | 1426                    | 56.13 | 1426                | 56.13 | 305                                | 12.00 | 305                 | 12.00 | 1610                 | 63.38 | 1623                | 63.88 | 330                                | 13.00 | 343                 | 13.50 |
|                  | 470                        | 18.50 | 1629                    | 64.13 | 1629                | 64.13 | 381                                | 15.00 | 381                 | 15.00 | 1788                 | 70.38 | 1788                | 70.38 | 381                                | 15.00 | 381                 | 15.00 |
|                  | 483                        | 19.00 | 1629                    | 64.13 | 1629                | 64.13 | 318                                | 12.50 | 318                 | 12.50 | 1788                 | 70.38 | 1826                | 71.88 | 318                                | 12.50 | 356                 | 14.00 |
|                  | 508                        | 20.00 | 1629                    | 64.13 | 1629                | 64.13 | 305                                | 12.00 | 305                 | 12.00 | 1813                 | 71.38 | 1826                | 71.88 | 330                                | 13.00 | 343                 | 13.50 |
|                  | 572                        | 22.50 | 1832                    | 72.13 | 1832                | 72.13 | 381                                | 15.00 | 381                 | 15.00 | 1991                 | 78.38 | 1991                | 78.38 | 381                                | 15.00 | 381                 | 15.00 |
|                  | 584                        | 23.00 | 1832                    | 72.13 | 1832                | 72.13 | 318                                | 12.50 | 318                 | 12.50 | 1991                 | 78.38 | 2029                | 79.88 | 318                                | 12.50 | 356                 | 14.00 |
|                  | 610                        | 24.00 | 1832                    | 72.13 | 1832                | 72.13 | 305                                | 12.00 | 305                 | 12.00 | 2016                 | 79.38 | 2029                | 79.88 | 330                                | 13.00 | 343                 | 13.50 |

**Table 11. Approximate Weights for Constructions without Handwheels**

| MAXIMUM VALVE TRAVEL | APPROXIMATE WEIGHT FOR ACTUATOR SIZE, kg (lbs) |           |           |           |            |            |            |            |
|----------------------|--|-----------|-----------|-----------|------------|------------|------------|------------|
| mm (inches)          | 12   | 14        | 16        | 18        | 20         | 22         | 24         | 26         |
| 102 (4.00)           |  |           |           |           | 402 (886)  | 475 (1048) | 662 (1459) | 761 (1677) |
| 203 (8.00)           |  |           |           |           | 430 (947)  | 505 (1114) | 702 (1548) | 804 (1771) |
| 305 (12.00)          | 157 (346)                                      | 245 (541) | 292 (643) | 337 (742) | 457 (1008) | 535 (1180) | 743 (1637) | 847 (1866) |
| 406 (16.00)          | 168 (370)                                      | 262 (577) | 311 (686) | 358 (789) | 485 (1069) | 565 (1246) | 783 (1726) | 889 (1961) |
| 508 (20.00)          | 179 (395)                                      | 278 (614) | 331 (729) | 379 (836) | 512 (1129) | 595 (1311) | 823 (1815) | 932 (2056) |
| 610 (24.00)          | 190 (420)                                      | 295 (650) | 350 (773) | 401 (883) | 540 (1190) | 625 (1377) | 864 (1904) | 975 (2150) |

**Table 12. Approximate Weights for Constructions with Handwheels**

| MAXIMUM VALVE TRAVEL | APPROXIMATE WEIGHT FOR ACTUATOR SIZE, kg (lbs) |           |           |            |            |            |             |             |
|----------------------|--|-----------|-----------|------------|------------|------------|-------------|-------------|
| mm (inches)          | 12   | 14        | 16        | 18         | 20         | 22         | 24          | 26          |
| 102 (4.00)           |  |           |           |            | 591 (1304) | 664 (1463) | 834 (1838)  | 925 (2038)  |
| 203 (8.00)           |  |           |           |            | 622 (1372) | 696 (1535) | 873 (1924)  | 965 (2128)  |
| 305 (12.00)          | 226 (499)                                      | 363 (800) | 292 (643) | 454 (1000) | 653 (1440) | 729 (1607) | 912 (2010)  | 1006 (2218) |
| 406 (16.00)          | 239 (527)                                      | 380 (838) | 311 (686) | 474 (1046) | 684 (1508) | 762 (1679) | 951 (2096)  | 1047 (2308) |
| 508 (20.00)          | 252 (555)                                      | 397 (876) | 331 (729) | 495 (1092) | 715 (1576) | 794 (1751) | 990 (2182)  | 1088 (2398) |
| 610 (24.00)          | 264 (583)                                      | 415 (914) | 350 (773) | 516 (1138) | 746 (1644) | 827 (1823) | 1029 (2268) | 1129 (2488) |

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